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2009 JUN 22 P 12:33

PUBLIC UTILITIES COMMISSION

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Application of	) DOCKET NO. 2008-0303
	)
HAWAIIAN ELECTRIC COMPANY, INC.	)
HAWAII ELECTRIC LIGHT COMPANY, INC.	)
MAUI ELECTRIC COMPANY, LIMITED	)
	)
For Approval of the Advanced Metering	)
Infrastructure (AMI) Project and Request to	)
Commit Capital Funds, to Defer and Amortize	)
Software Development Costs, to Begin	)
Installation of Meters and Implement	)
Time-of-Use Rates, for Approval	)
of Accounting and Ratemaking	)
Treatment, and Other Matters.	)

LIFE OF THE LAND'S TESTIMONY

HENRY Q CURTIS (LOL-T-1),

MOTION FOR DISCOSURE

&

CERTIFICATE OF SERVICE

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I am Henry Q Curtis, Executive Director and Vice President of Life of the Land. I am testifying on behalf of Life of the Land on issues relating to Advanced Metering Infrastructure ("AMI"), Time of Use Rates ("TOUR"), and Smart Grids.

The Application

On December 1, 2008, Hawaiian Electric Company, Inc. ("HECO"), Hawaii Electric Light Company, Inc. ("HELCO") and Maui Electric Company, Inc. ("MECO"), collectively referred to herein as the "HECO Companies" or "Companies", filed an application requesting Commission approval of the Advanced Metering Infrastructure ("AMI") project.

The Parties

February 13, 2009 the Commission granted the motions to intervene of Life of the Land ("LOL"), Hawaii Renewable Energy Alliance ("HREA") and Hawaii Solar Energy Alliance ("HSEA"). The HECO Companies, Consumer Advocate, LOL, HREA, and HSEA are collectively herein referred to as "Parties."

The Issues

On April 21, 2009, the Commission amended the proposed Stipulated Procedural Order agreed to by the Parties. The issues in the docket are".

1. Is the HECO Companies' proposal to implement the AMI project reasonable?

2. Are the estimated project costs reasonable?

3. Is the proposed accounting treatment of AMI project costs reasonable?

4. Is the proposed cost recovery of AMI project costs for ratemaking purposes reasonable?

5. Are the terms and conditions of the Sensus Agreement between HECO and Sensus Metering Systems, Inc. reasonable, prudent and in the public interest?

6. Are the proposed time of use rates reasonable?

Confidentiality

The HECO Application, dated December 1, 2008, pages 21-22 states: "A summary of the agreement is provided in Exhibit 1. The Sensus Agreement is confidential and proprietary and a copy will be provided separately after a Protective Order is issued in this docket."

The HECO Application, dated December 1, 2008, PDF page 113 of 304 states: "Exhibit 7 contains confidential information and will be provided after a Protective Order is issued in this proceeding."

A HECO letter dated May 4, 2009 states: "Pursuant to the Protective Order approved by the Commission on April 15, 2009 in this proceeding, the HECO Companies' provide the following confidential exhibits:

Exhibit 1(A) - Advanced Metering Infrastructure Equipment and Services Agreement between Sensus Metering Systems, Inc. and Hawaiian Electric Company, Inc., executed on October 1, 2008 ("Sensus Agreement");

Exhibit 7, pages 5 to 8 and 10 to 21. A summary of the Sensus Agreement was provided as Exhibit 1 in the Advanced Meter Infrastructure ("AMI") application.

The Companies stated that the Advanced Metering Infrastructure Equipment and Services Agreement between Sensus Metering System and HECO was confidential and proprietary and would be provided after a protective order was issued in this docket. The Companies hereby submit the confidential Sensus Agreement as Exhibit 1(A) to the AMI application."

Exhibit 1(A), dated April 15, 2009, page 3 states: "CONFIDENTIAL Subject to Protective Order ... "Commission" mean the Public Utilities Commission of the State of Hawaii"

Exhibit 1(A), dated April 15, 2009, page 31 "CONFIDENTIAL Subject to Protective Order ... The islands of Oahu, Maui, and Hawaii Island (see map below)."

Exhibit 7, dated April 15, 2009, page 12 states: "CONFIDENTIAL Subject to Protective Order ... Lee Melville - Bachelors in Electronics, and Masters in Engineering Management" This information is readily available on the web at several sites including TDWorld, ZoomInfo and Enspiria (http://enspiria.com/pdfs/LADWP%20Automation%20Initiative%20T&D%20World%20Reprint.pdf)

Exhibit 7, dated April 15, 2009, page 5 states: "CONFIDENTIAL Subject to Protective Order ... Ontario Independent Electricity System Operator: Member of team charged with developing and delivering a Meter Data Management Repository for IESO, the organization responsible for operating Ontario's wholesale electricity markets"

This is public information: "In April 2008, the Office of Consumer Affairs, Industry Canada granted the Consumers Council of Canada funding to conduct research on the Government of Ontario's plan to introduce smart electricity meters. The Government of Ontario is currently in the process of facilitating its commitment to install 800 000 smart electricity meters in homes and small businesses by the end of 2007, and throughout Ontario by 2010. The introduction of the smart meters will allow for the introduction of flexible, time-of-use pricing intended to encourage a conservation culture in Ontario aimed at reducing overall electricity use and peak demand. The implementation of the smart meter initiative is being carried out by the Ontario electricity distributors with direction from the Ministry of Energy and the Ontario Energy Board. In addition, the Ontario Independent Electricity System Operator (IESO) has been given the mandate to establish a Meter Data Management Repository, providing a common infrastructure for the management and storage of consumption data received through the new meters. Consumers in Ontario stand to benefit from this initiative, but will also be responsible for the costs. In fact, many Ontario consumers are currently paying for the costs of the meters, although the meters have not yet been installed. Of more concern, the technology is not yet capable of billing on the basis of time-of-use pricing" (www.consumerscouncil.com/index.cfm?pid=20573)

Motion for Disclosure

The Commission issued a Protective Order, dated April 15, 2009. Page 6 states in part: "8. Any party claiming that Information is confidential shall place upon the applicable material the following legend: CONFIDENTIAL SUBJECT TO PROTECTIVE ORDER Whenever only a portion of a document, transcript, or other material is deemed to contain confidential information, the party shall, to the extent reasonably practicable, limit the claim of confidentiality to only such portion."

In order to complete our testimony and prepare for cross-examination, Life of the Land needs to be able to discuss, at the very minimum, the Agreement's effective date and termination conditions (Exhibit 1(A), pages 18-19), and the AMI System Performance Specification (Exhibit 1(A) Exhibit E, pages 80-89).

What is Advanced Meter Infrastructure?

Advanced Meter Infrastructure ("AMI") is a cost savings system (automatic meter reading) that will enable implementation of the Smart Grid.

What is a Smart Grid?

A smart grid is an electricity transmission and distribution system joining traditional and new, digital age, communication, sensor, and power engineering technology. The goal behind the smart grid is to improve upon current standards of grid performance by making it more efficient, "self healing," secure, able to support wide use of distributed generation, and enable end-users to regulate their own equipment for optimal savings and functioning. Thus, the term "smart grid" does not refer to a specific technology, like smart meters or voltage sensors, but to a grid system that possesses the above characteristics.

Once the infrastructure for the smart grid is in place, utilities will be able to see how much energy is being spent at any point within the network and tell, in real time, if there are problems or looming blackouts. The utilities can then isolate those areas or decrease the load on the grid to solve the problems.

Alternatively, there are currently areas of the country where utilities only become aware of a blackout once a customer calls and reports it.

End-users will also be informed of details regarding personal power consumption and use in real time, down to which appliances, outlets, specific buildings, or parts of their businesses are using the most energy, and be able to adjust their usage accordingly.

A key facet of the smart grid is that because the two-way communication between the utilities and consumers can happen in real time, the price of energy will fluctuate depending on peak energy usage and demand times. This means that energy prices will be highest during the "rush-hour" of energy usage and lowest during downtime. Ideally, end-users will decrease energy consumption during price hikes, which will ease the grid during the most critical times and lower the chance of blackouts.

The idea is that the utilities be able to better manage the load on the grid, while the consumers save money on their monthly bills. Also, smart grids will allow users to have the option of using certain appliances or power in general only when preferred renewable sources of energy like wind or solar are available.

As the smart grid integrates large transmission and distribution systems, it will be possible to incorporate renewable energy and new technology into the grid system effectively. Energy technologies to be incorporated include electric vehicles and plug-in hybrids, energy storage, wind turbines, Photovoltaic Systems, Geothermal, Biomass, and Combined Heat and Power (CHP).

The smart grid can effectively transport the various sources of energy to their optimal locations, so, for example, areas without significant wind can still benefit from wind turbines built in the Northeast or the coastal regions. Potentially, the smart grid will revolutionize the energy, environmental, business, and communication fields.

Who has a smart grid?

Not too many countries, states or cities have actually implemented smart grids. Italy was the first country to develop a smart grid having installed 27 million smart meters from 2001-05.

What are the benefits to a smart grid?

There are many associated benefits with a smart grid in comparison to the grid in place today. The smart grid will be

Efficient/Economical – As the grid works today, it is built so that it can meet the highest expected power demands, meaning that billions of dollars are spent on building towers and power plants that are rarely even used. This is to such an extreme that barely over 50 percent of the grid infrastructure standing today is utilized, as some parts of the grid are used for only a few hours each year during annual peak energy spikes. Under a more decentralized grid system able to accurately sense grid load, the overall energy consumption will be more harmonized, with rounder spikes, and more effective means of dealing with high loads.

Furthermore, as the grid will be much better able to avoid large scale blackouts and more quickly solve grid problems, a lot of money can be saved in the process. For example, the August 2003 blackout of the Northeast cost $6 billion, a figure that could have either been avoided altogether or greatly reduced. The increased efficiency of the grid will also increase its reliability, as outages can be better anticipated and studied afterwards if they do occur. Also, sensors will be able to gauge the equipment performance and condition data – the result will be a general decrease in operation and maintenance costs, with savings from productivity improvements, such as the elimination of routine tasks and reductions in material use.

The smart grid will also allow end-users to make informed decisions about energy usage in real-time, resulting in the ability save money when the prices spike. Those same users will also have the ability to sell back excess energy generated via home or business solar panels or wind turbines.

Overall, the Electric Power Research Institute provides a deemed conservative estimate of 1 to 4 ration of cost to benefit for implementing an extensive smart grid. The smart grid will be not only economical in terms of saving money, but it will be good for the economy in general, as there will be tremendous gains in job creation. Jobs will be created in everything from installing sensors and building infrastructure of the smart grid to high-tech research and development positions.

Environmentally Friendly – The overall improved efficiency described above will also serve to decrease the overall energy consumption and waste. Furthermore, because the smart grid will enable the deployment of all forms of generation and storage, including those that are environmentally friendly, it will encourage the deployment of such environmentally friendly energy generators. The greater use of distributed energy will reduce the need for construction of new transmission facilities and central power plants.

The smarter end-user management of energy will also have significant effects on power consumption and the environment, as users it will be in the users' best interests to avoid costly peak prices and try to use energy scheduled around both cheap times and those when an environmentally-friendly source of energy is available.

Unknown – Just like with the invention of the internet, it is impossible to tell just how much the smart grid can ultimately change our lives. It could potentially develop into an information and communication system around which our lives circulate or simply be a more efficient way to run a grid.

Smart Grid Options

Smart grids can lead to more effective use of time or use rates, demand response, and peak shaving.

Time-of-Use Rates

On islands such as O`ahu, the average daily peak load is twice as high as the average daily minimum load. Flattening the load would lead to a more stable grid and less need for costly peaking units which currently may be operated only a small percentage of the time. the O`ahu peak is around 5-8 pm, requiring peak power after the sun has set, but while concentrated solar power systems could still provide electricity. Hawaiian Electric was an early implementer of Time Of Use Rates; however their practice was to reward customers who had flat loads (that is, customers who had the same energy demand 24/7. Modern Time Of Use Rates rewards customers who use power off-peak. In its simplest application, there would be three rates: off-peak, shoulder, and peak. The spread varies by utilities, from 1 to 100 percent. The higher the discount for off-peak use, the more customers will switch.

For customers with self-generation, and the willingness to forgo grid energy during peak periods (weekdays 8 am to 10 pm), the customer could receive discounted renewable energy during off-peak (weekends and nights: 10 pm - 8 am) similar to cell phone discounting. Electric vehicles would be powered at night and could supply back-up power to the building during the day. The building-vehicle energy system would provide energy for heating, cooling, electricity and ground transportation.

Demand Response ("DR")

When the electrical grid nears peak capacity or when generators and/or transmission lines fail, the utility can face serious problems.
Demand Response (DR) is a dynamic (real-time) method for the utility to curtail the use of electricity by shedding customers or turning off customer appliances such as electric water heaters and air conditioning. Customers signing up for Demand Response often receive a discount on their electric rates in exchange for the right to be curtailed.

Peak Shaving

Since the advent of man-made electricity, there has been a problem of uneven daily electricity usage. In the 1870s and 1880s there was tremendous demand for energy for lighting in the evenings. There was little demand for daytime usage. To offset night-time energy use, hundreds of municipalities across the country began offering electric trolley service.

This interfered with the advent of the automobile, so as the historically accurate film "Who Framed Roger Rabbit?" pointed out, the automobile, fossil fuel and timber interests purchased and destroyed the electric trolley in Los Angeles, so that people could ride automobiles down freeways and get supplies along off-ramps.

Now the problem is that there is much greater use of energy during the days. On Oahu, the average of all daily peak loads is twice the average of all daily minimal loads.

Some have suggested that we convert to electric vehicles and power them at night. Night time electricity on O`ahu is produced by big continuously running baseload generators, such as the AES 200 MW coal plant in Campbell Industrial Park.

Customer Usage

Most customers have a meter that is read once a month by a meter reader. This is a costly way of getting the data. By using internet-like chips, the meters can be read automatically. But equally important for our discussions here, in order to charge customers different rates at different times of the day (time of use rates), to cut back customer use during critical periods (demand response) and to level the load (peak shave), the utility must be able to track customer loads several times within each day. Clearly this can't be done with meter readers, so meters must become smart (able to communicate with the utility mainframe).

HECO's Proposal

This regulatory proceedings deals with Hawaiian Electric Company, Inc. ("HECO"), and its subsidiaries Maui Electric Company, Limited, and Hawaii Electric Light Company, Inc. (collectively, "HECO Companies") request to the Public Utilities Commission ("Commission") approval of a 15-year contract with Sensus Metering Systems, Inc. ("Sensus").

The Advanced Metering Infrastructure Equipment and Services Agreement ("Sensus Agreement") is confidential.

This regulatory proceedings also deals with capital expenditures by the utility ($60M+ of ratepayer money), an Advanced Metering Infrastructure ("AMI") system, a Meter Data Management System ("MDMS"), and establishment of Time-Of-Use Rates ("TOUR"). "The AMI communications and smart metering infrastructure provides a foundation for the implementation of Smart Grid technology" (HECO Application page 7)

Hawaiian Electric Selects Sensus FlexNet AMI (TDWorld, Jan 8, 2009) "Officials of Hawaiian Electric Co. and Sensus Metering Systems have announced a 15-year definitive agreement for mass deployment of Sensus Metering Systems' FlexNet wireless smart grid solution. The decision comes after two years of rigorous field testing of the FlexNet system, where thousands of smart electric meters were tested in a variety of settings, terrains and environments on Oahu. Subject to Hawaii Public Utilities Commission approval of Hawaiian Electric's AMI plan, approximately 430,000 residential and commercial electric customers will be transitioned to the Sensus FlexNet smart meters between 2009 and 2015. Just 19 tower network sites throughout Oahu, Maui, and Hawaii Island will provide the advanced, two-way radio frequency network coverage based on Sensus' primary use licensed frequency, which allows for secure, reliable transmissions over a wide range. The FlexNet system provides Hawaiian Electric with two-way communications to Sensus' iCon smart electric meters, which enables on-demand reads, remote connect/disconnect services, notifications of outages and restoration, and remote firmware upgrades. FlexNet also establishes the platform for additional customer and utility system-related benefits in the future. These features will support new pricing and demand-response initiatives to help customers manage their own electricity use by taking advantage of various pricing options, and programs designed to enhance energy conservation efforts." http://tdworld.com/info_systems/highlights/heco-sensus-flexnet-0109/

Meter Reading

Computer based meter reading can occur very often. Meters are read once an hour in Denmark, Finland, Norway, Poland, Spain, Sweden; twice an hour in the United Kingdom, four times an hour in Germany, Ireland, Netherlands, Portugal and six times an hour in France. For HECO this information is sealed under protective order. (Survey of regulatory and Technological Developments Concerning Smart Metering in the European Union Electricity Market by Jorge Vasconcelos (2008) http://cadmus.eui.eu/dspace/bitstream/1814/9267/2/RSCAS_PP_08_01.pdf)

AMI does not mean AMI

On the one hand "Advanced Metering Infrastructure (AMI) technology continues to improve every day and many utilities throughout the country are moving from the pilot phase into full-scale AMI deployments." (HECO Powerlines Fall 2007, HECO Application, Exhibit 14, page 10) And on the other hand, what everyone is racing to do is not the same thing: "There is no single, universally accepted definition of the components that, taken together, constitute an advanced metering infrastructure. When analysts, utilities, regulators, stakeholders and others use the term "advanced metering infrastructure" in the case of electric utilities, they do tend to refer broadly to a collection of hardware (e.g., meters and computer processors), software (e.g., billing system computer programs) and other elements that taken together permit the utility to perform certain functions." (Sensus Agreement Summary_Exhibit 2: page 1 of 3)

Buzzwords

The term "smart grid", is sort of like "sustainability" or "smart growth". Who could be against it, but what does it mean beyond the buzzword?

Steven Brown, editor in chief of *Utility Automation & Engineering T&D* (March, 2008) stated: "There is, I think, a danger in the overuse of this term "smart grid," however. As I walked from booth to booth in the DistribuTECH exhibit hall, I began to notice that nearly every supplier present had a "smart grid" device or system to offer. In many cases, I found myself at an exhibitor's booth looking at roughly the same type of device or piece of software I've been seeing at DistribuTECH for years—except this year, the product was emblazoned with the new phrase du jour. I wasn't looking at a meter; I was looking at a smart grid end-point device. I wasn't looking at a distribution automation system, or a geographic information system, or an automated dispatch system; I was looking at a smart grid solution. I'm pretty sure there were even circuit breakers on display that boasted an IQ higher than mine. And maybe all those technologies I've been seeing at DistribuTECH for nearly a decade really were smart grid solutions all along—we just didn't know it until now. At some point, though, I think a stricter definition of "smart grid" is in order, lest the term lose all significance."

Benefits

Then there is the question of what we are seeking to do: reduce fossil fuel use, increase energy efficiency, decrease outage time, lower rates, and/or increase consumer costs?

"AMI refers to systems that measure, collect and analyze energy usage, from advanced devices such as electricity meters, gas meters, and/or water meters, through various communication media on request or on a pre-defined schedule. This infrastructure includes hardware, software, communications, customer associated systems and meter data management software. The network between the measurement devices and business systems allows collection and distribution of information to customers, suppliers, utilities and service providers." (HECO Response to CA-IR-3, page 1) "The benefits of AMI can generally be broken down into four types: (1) operational benefits (e.g., meter reading savings and field service savings); (2) customer benefits (e.g., meter accuracy gains and energy theft reduction); (3) future capital expenditure reduction ... and (4) future systems benefits" (HECO Response to CA-IR-7, page 2)

Which Smart Future?

SciTechBlog: "Does the smart grid make you feel dumb? The latest buzzword on the energy forefront is "smart grid." You may have seen the GE commercial featuring a re-worked scarecrow from the "Wizard of Oz" touting smart-grid products that promise to save you money, help keep the world green and make pink bunnies grow like wildflowers in your yard (well maybe not – but they do promise a lot). ... All of that is very cool, but it's a long way away. ... Our current system is built around centralized power plants delivering energy to nearby areas. What we need to take full advantage of wind and solar power is a whole new grid — a decentralized one that can move power easily from one place to another." (http://scitech.blogs.cnn.com/2009/03/02/does-the-smart-grid-make-you-feel-dumb/)

This is crucial. Do we want an overly centralized grid that can't add significant renewables before 2015 because the Maui and Big Island Grids are already saturated and on O`ahu, the utility is reserving renewable space for the Big Wind Project (400 MW from Moloka`i and Lana`i) will be coming on-line in 2015?

Should we instead encourage rapid deployment of on-site generation? In measuring success: What are the metrics, the measurements, the Baseline?

Distributive not Command and Control

In the US, the wall sockets can not be the basis for grid computing. For smart grids, there is a need for access points that can be identified for data and information transfer between the point of usage and the power generating system. This is very similar to a computer access point, which enables a connection to the internet. This need for a two-way communication mechanism is crucial and investment-intensive.

Distributable power is the key to smart grids. The technology exists for centralized generation and distribution but only in one direction - from the electric provider to the customer. This poses a challenge to establish smart grids that need to distribute power effectively on a platform which is more diverse and easily distributable - not necessarily centralized.

I think the issue of distribute power is worth reinforcing. The utility can have the smartest grid on the planet. If, on the supply side, the utility is not committed to rapid development of wide-scale distributed (renewable) generation (as evidenced by the utility's proposed feed-in tariff), then the utility is starting by forfeiting half of the smart grid benefits – those related to dispatch of distributed generation.

Grid Studies Not Complete and/or Publicly Available

The Studies have not yet been developed, and the non-HECO parties can't even see the draft versions of Phase 1 of the Reports:

"the Companies commissioned the following studies of the Companies' electric grids: (1) the General Electric Studies (HECO, MECO, and HELCO) ... Phase I ... is being developed ... to establish a baseline condition. ... Phase 2, which will analyze the technical and economic impact of infrastructure expansion scenarios (more renewable energy and possible integration technologies) relative to the baseline condition. ... more in-depth analysis and additional studies will be required in order to determine the extent to which a particular system may be able to integrate a specific project, and to evaluate the particular system requirements associated with such integration.

The Phase 1 studies for both the HELCO and MECO systems [but not HECO] have been completed. ... The HECO Companies are in the process of securing final electronic versions of the documents and will make the studies available ...

to the parties via email, as soon as the electronic versions are secured." (HECO Companies' Response to Life of the Land Information Request to HECO (LOL-IR-1))

Release of Grid Studies

HECO should provide grid studies in a reasonable and timely way prior to the date other parties must file Information Requests re HECO's Testimony.

Alternative Solutions

The recent oil price spike triggered a reduction in demand for electricity. Would a similar hike be more or less effective in reducing fossil fuel consumption that AMI? How about an inverted block system with low costs for the first unit and substantial increases for larger blocks.

Are there energy efficiency alternatives that could more effectively improve grid operations? Could SAIC, after becoming fully operation in Hawai'i, offer solutions that might be more cost-effective?

SAIC: "Advanced Metering Infrastructure (AMI) ... is often confused with Automated Meter Reading (AMR), which simply removes the human from the mundane chore of performing monthly meter reads. AMR is actually a subset of AMI. ... In order to change customer energy usage behavior, intelligent systems to monitor energy consumption are needed to support interval or time differentiated pricing, and provide mechanisms to viably reduce load during peak periods. AMI supports the automated systems designed to manage this process. Although this concept is nearly universally agreed upon, it is complicated by vendors working to protect their proprietary solutions. Energy companies struggle in deciding which AMI solution to choose since that decision potentially locks them into a single vendor's proprietary offering. There is a critical need to have an open, vendor-neutral, abstraction layer between utility back-office applications and the complex world of AMI. This layer needs to insulate the energy companies from the myriad of proprietary communication protocols, data formats, and 'smart' device interfaces. ... AMI has widespread industry acceptance but limited implementation." (An Open Systems Abstraction Layer Strategy by Michael Ash, Senior Scientist, SAIC; Stuart McCafferty, Technical Manager, SAIC http://www.energypulse.net/centers/article/article_display.cfm?a_id=1066)

HECO is not going with either an open source system.

Risks

"HECO executed an Advanced Metering Infrastructure Equipment and Services Agreement, dated October 1, 2008 ("Sensus Agreement"), with its AMI vendor, Sensus Metering Systems Inc. ("Sensus")" (HECO Application, Exhibit 1, page 1 of 2) "the Companies executed a 15-year contract with Sensus" (HECO Response to CA-IR-21(b)) "The AMI Network will be owned, operated, and maintained by Sensus and leased by the HECO Companies per the Sensus Agreement executed by the Companies. A shared MDMS will be centrally located at HECO." (HECO Application, page 16) "The Sensus AMI meters will have a one year warranty and an expected life of 15 years. In addition, based on data provided by Sensus, the Companies anticipate a meter failure rate of 1% per year." (HECO Application, page 21)

Just as with any other technology, the smart grid technology has some drawbacks. One of the major disadvantages of smart grids is that it is not simply a single component that consists of the technology. There are various technology components such as: software, the power generators, system integrators, etc. Not every company is on a level playing field to take the risks necessary to build a smart grid. This is the reason many utility companies refrain from venturing into this area. They want other companies to take the risk so that they can follow later, safely.

Contract Length

HECO argued in its proposed biofuel contract with Imperium that in pioneering new areas it was important to have a short contract so that lessons could be learned. However, in this case, HECO is not going with a short-term contract but a 15-year contract during a period of great transition.

Dangers

A number of risks have made the national press regarding AMI. These include"

(1) Cyber Security (hacking into utility programs to either affect the grid or to obtain customer information). See Exhibit 2: Security Alert: Risks Change with AMI by Betsy Loeff, Utilimetrics News Writer;

(2) Customer Privacy (access to customer information, knowing when the customer is in or out, knowing what appliances they are using; those entrusted with our privacy often don't have much incentive to respect it). See Exhibit 1: Privacy Challenges Could Stall Smart Grid by Susan L. Lyon (June 1, 2009);

(3) Costs out of line with Rewards (gold-plating a new system where the costs either exceed the benefit, or are far more expensive than other programs which would achieve similar benefits).

What are the risks re Security & Big Brother?

One of the risks associated with the smart grid is that the end-users will not be as enthusiastic or caring about their involvement within the smart grid system. In the Boulder, Co. example, some users complained that the high-tech gadgets were too confusing and difficult to understand, even though the city was chosen because of its well-educated population.

Furthermore, other users stated that the process can be cumbersome, boring, and time consuming, signaling that users may prefer to deal with lower energy efficiency and higher prices to avoid dealing with the matter in general. Nevertheless, development companies are in the works of making the technology and the process in general more user-friendly, and once the technology is around long enough for users to habituate to it, they should become happy simply to take advantage of the innovation. Just think of how much exponentially complex and yet user-friendly electronics and computers have become over the past twenty years; the smart grid is in its developmental stage. Also, if end-users are not that responsive to the price fluctuations of the smart grid, then the average energy bill could be expected to go way up, as consumers would be paying for at-peak energy prices. Furthermore, it is questionable if businesses and many households have the option of avoiding energy usage during peak times, leading to an unfair disadvantage for those users.

The security of the grid to hacker attacks is in some question. It seems that once the proper software technology can be developed, the smart grid has potential, with the right programming, to be much more secure than the current grid.

Because the smart grid will be completely computerized, with sensors indicating problems and concerns along every part of the grid, operators will also be better able to respond to better to any attack and detect it when something first happens. Furthermore, the decentralized nature of the smart grid gives operators far more options to mitigate a problem once it has occurred, as different energy sources can be channeled to the affected sources. Also, because the smart grid is decentralized, gaining control of a part of the system will have little effect on the system as a whole, as no one part of the system can affect too large of an area. Nevertheless, as the smart grid connects and controls so many streams of information together, hackers may have more motives to get into the system. The promoters of the smart grid may be blindly hoping that the system will be secure; however, as some sources say that hacking into the system is not all that difficult.

The risk of the smart grid becoming like Big Brother should not be overlooked, as the technology associated with the smart grid can eventually form into something resembling Big Brother quite closely. However, it is not the smart grid itself that would be Big Brother, but the intentions behind those that develop and implement it. The Big Brother issue has been addressed in various ways where it has come up.

For example, last year, regulatory officials met a storm of protest in California when they considered requiring all new homes have a thermostat that utilities could remotely adjust.

However, the key to that story is that the regulators withdrew their proposal when they saw it did not sit well with the public. Nevertheless, having the ability to remotely control users' power to an extent could have significant benefits for society as a whole, as scary as that sounds. If operators sense that a blackout may be coming, turning down the thermostat by one degree of every household could have significant implications and save the users from having to deal with the blackout, at the expense of utility control. Also, giving the automated computer have some levels of control can be beneficial to the users and is part of the system in place in Boulder, Co. For example, having the luxury of telling the computer that a user only wants air conditioning to be at maximum only when there are renewable sources of energy available frees the user from constantly having to monitor the grid information. Also, users can have the option of letting utility companies control appliances like heaters and air-conditioners to a small extent that the user chooses, say five degree range for each, can also be beneficial for both user and utility. The users can benefit from their thermostats automatically adjusting to price fluctuations to optimize costs, and the utilities can solve problems and avoid blackouts. The overall point about Big Brother is that yes, the smart grid may have the capability of acting on Big Brother's behalf, but regulations and agreements can be set up to avoid it. The Big Brother issue is the one issue I am really having problems with, since the smart grid can become advanced enough that everything plugged into the outlet will eventually be known to the utility company, letting them known anything and everything in the home and when and how it's used. It seems as if the users may have to throw away their rights to privacy to see all the other benefits.

What are the risks re Privacy & Cybersecurity?

Hawai`i's Constitution is informed by our unique history: The illegal overthrow of the Hawaiian Kingdom, the arrest and imprisonment of Queen Liliu`oklani, the imposition of Martial law during World War II, the arrest and imprisonment of Hawai`i citizens based solely on their Japanese ancestry. These visceral events led to the strong privacy clauses enshrined in the Hawai`i Constitution. These rights are stronger than those rights guaranteed by the U.S. Constitution.

In an April 16, 2009 article, VP Biden outlined plans to distribute more than $3.3 billion in smart grid technology development grants and an additional $615 million for smart grid storage, monitoring and technology viability as part of the American Recovery and Reinvestment Act.
(Source: Vice President Biden Outlines Funding for Smart Grid Initiatives http://www.energy.gov/news2009/7282.htm)

Life of the Land is adamant about upholding the privacy rights enshrined in our Constitution. Our concerns stem from the fast track of this docket, thus our highlighting the privacy issues involved with a two-way information system and the need to engage all stakeholders before we start bartering away constitutional rights. As Supreme Court Justice Thurgood Marshall said, "History teaches us that grave threats to liberty often come in times of urgency, when constitutional rights seem too extravagant to endure."

On April 17, 2008 DOE announced membership of its newly-established Electricity Advisory Committee. The 30 inaugural members will serve one- or two-year terms and include some of the nation's top public and private sector leaders in electricity policy, planning and operations. The Committee was established to provide counsel to the Department on long-range planning and priorities for the modernization of the Nation's electricity delivery infrastructure.

The following excerpts are from the Department of Energy's Electricity Advisory Committee report released in December 2008 entitled, Smart Grid: Enabler of a New Energy Economy.
(Source: www.oe.energy.gov/DocumentsandMedia/final-smart-grid-report.pdf)

> Improved Security System
>
> "While the North American Electric Reliability Corporation (NERC) has developed Critical Infrastructure Protection standards to address these issues, Smart Grid technology and capabilities will offer better integration of these devices, increased use of sensors, and added layers of control. Smart Grid technologies, however, can bring their own cyber security concerns, which will require comprehensive, built-in security during implementation. (page 8)
>
> 3.7 Security
>
> The vision of a Smart Grid typically boasts enhanced system security. Indeed, the report A Systems View of the Modern Grid, published by the U.S. Department of Energy (DOE) and the National Energy Technology Laboratory (NETL) in January 2007, includes "resists attack" as one of seven principal characteristics of the future Smart Grid.38 The DOE report goes on to list the following design features and functions:
>
> Identification of threats and vulnerabilities

Protecting the network

Inclusion of security risk in system planning

Expected benefits include:

Reduced system vulnerability to physical or cyber attack

Minimal consequences of any disruption, including its extent, duration, or economic impact

Using security-related improvements to also help optimize reliability, communications, computing, decision-making support and self-healing

However, many of the technologies being deployed to support Smart Grid projects—such as smart meters, sensors, and advanced communications networks—can themselves increase the vulnerability of the grid to cyber attacks. Accordingly, it is essential that Smart Grid deployment leverage the benefits of increased threat awareness while mitigating against heightened security concerns. It will be a difficult task, but one that can be addressed by being aware of the risks and leveraging security best practices from other industries. "

...

CYBER SPACE POLICY REVIEW - Assuring a Trusted and Resilient Information and Communications Infrastructure (Source: www.whitehouse.gov/assets/documents/Cyberspace_Policy_Review_final.pdf

Evaluate Potential Barriers Impeding Evolution of Public-Private Partnership

"...the Federal government should engage academia, civil liberties and privacy groups, advocates of open government, and consumers to ensure that government policy adequately considers the broad set of interests that they represent. Few problems can be reduced to a discrete question of process, policy, or technology. Changes in technology often precipitate policy considerations and may require changes in existing processes. Changes in policy (for example, adoption of regulation or tax incentives) can affect decisions regarding procurement or technological research and development. The Federal government could also consider ways in which it could focus more resources on research into possible "game-changing" areas, such as behavioral, policy, and incentive-based cybersecurity solutions. The interwoven nature of these issues underscores the need to ensure that all stakeholders' interests are represented." (page 19)

...

Report: Cyber-Spies Studying U.S. Electricity Grid
http://www.govtech.com/gt/637160
Apr 8, 2009, By Matt Williams, Assistant Editor

"Computer spies from China, Russia and other countries are tunneling into the U.S. electricity grid with increasing frequency in order to study America's infrastructure, The Wall Street Journal reported Wednesday. An unnamed intelligence official told the newspaper that hackers have left behind software tools that could be turned on during a war in order to damage critical infrastructure systems.

The revelation comes amid growing public sentiment for transforming the U.S. electrical grid into a "smart grid." It would rely upon IT to help utility companies manage peak loads and allow consumers to sell back excess power to the grid during off-peak hours.

An estimated $11 billion from the economic stimulus bill President Barack Obama signed in February is dedicated to enacting standards for the smart grid and funding test cases..."

"A December 2008 report from the U.S. Department of Energy's Electricity Advisory Committee said utilities are increasingly using digital devices in substations to improve protection and increase reliability and control. "However, these remotely accessible and programmable devices can introduce cyber-security concerns," according to the report. While smart-grid technology offers more layers of control, it will require built-in security during the implementation, according to the report..."

Safe bets: Why cyber security should be part of AMI planning
http://uaelp.pennnet.com/display_article/303682/22/AMI/AMIFA/none/1/Safe-bets:-Why-cyber-security-should-be-part-of-AMI-planning/

" Two-way threat

The two-way capability in most advanced metering infrastructures presents a two-way threat. Hackers can poke their uninvited fingers into utility assets -- like substations -- or compromise the privacy of utility customers by peeking into their consumption data.

An example of privacy invasion might be this: A burglar uses meter data to find a home where there is little or no consumption going on, indicating that the house is unoccupied. ...

Meters themselves are tamper-proofed to be physically secure, he continues, but what's going into the meter is not necessarily secure electronically. That means someone potentially could compromise a data packet going from a meter to a substation, thereby disrupting substation operations or even moving the data on to damage the grid. ...

Smarter but more vulnerable

Automated controls add complexity and vulnerability to utility networks, too. For instance, advanced meters often have connection and disconnection capabilities. With them, hackers might be able to knock utility customers out of service."

Twenty Critical Controls for Effective Cyber Defense: Consensus Audit Guidelines
http://www.sans.org/cag/guidelines.php
Version 2.0: May 9, 2009

"Summary

This document has been developed through the collaboration of a diverse set of security experts. While there is no such thing as absolute protection, proper implementation of the security controls identified in this document will ensure that an organization is protecting against the most significant attacks. As attacks change, additional controls or tools become available, or the state of common security practice advances, this document will be updated to reflect what is viewed by the collaborating authors as the most important security controls to defend against cyber attacks

The Twenty Critical Controls

These 20 critical security controls were agreed upon by knowledgeable individuals from the groups listed above. The list includes 15 controls that can be validated at least in part in an automated manner and five that must be validated manually. It is important to note that the 20 control categories are not presented in order of priority. The process of gathering these specific controls and subcontrols focused on identifying the highest priority defenses and represent a subset of controls found in other audit guidelines and documents. Each of the 20 categories is important and offers high-priority techniques for thwarting real-world attacks.

Critical Controls Subject to Automated Collection, Measurement, and Validation:

Inventory of Authorized and Unauthorized Devices
Inventory of Authorized and Unauthorized Software
Secure Configurations for Hardware and Software on Laptops, Workstations, and Servers

Secure Configurations for Network Devices such as Firewalls, Routers, and Switches

Boundary Defense

Maintenance, Monitoring, and Analysis of Security Audit Logs

Application Software Security

Controlled Use of Administrative Privileges

Controlled Access Based on Need to Know

Continuous Vulnerability Assessment and Remediation

Account Monitoring and Control

Malware Defenses

Limitation and Control of Network Ports, Protocols, and Services

Wireless Device Control

Data Loss Prevention

Additional Critical Controls (not directly supported by automated measurement and validation):

Secure Network Engineering

Penetration Tests and Red Team Exercises

Incident Response Capability

Data Recovery Capability

Security Skills Assessment and Appropriate Training to Fill Gaps"

Life of the Land wishes to emphasize the importance of bringing stakeholders together (academia, civil liberties and privacy groups, advocates of open government, and consumers) to ensure that government policy adequately considers the broad set of interests that they represent. This proposal has wide reaching implications that we wish to bring to the Commission's attention.

State Law

Neither "Advanced Metering Infrastructure" nor "Smart Grid" are mentioned in the Hawaii Revised Statutes. Yet HECO states: "AMI has - particularly in recent years — received wide support at both state and federal levels, in the form of measures including ... Hawaii legislature concerning the development of renewable energy and reduction of greenhouse gas emissions in Hawaii." (HECO Application, page 6)

Timing

The HECO Companies are rolling our new transformative dockets at a speed never before seen in Hawaii since HECO was established in the 1800s and the Public Utilities Commission ("Commission") was established in 1913.

All of these dockets are being rolled out and requested for approval between the closing of the old Utility Planning process (Integrated Resource Planning ("IRP")) and the new Utility Planning process (Clean Energy Scenario Planning ("CESP")).

In the proposed CESP Framework docket, HECO is proposing to fast track projects. The utility proposes to have a year to come up with a CESP plan. The Commission must rule on it within 6 months. If the Commission rejects anything they have to explain how it will financially impact the utility. If something is in the CESP, there is a presumption that it is needed. However, just because something is in the CESP does not mean that the utility must do it. Furthermore, the utility may do anything outside of the CESP as long as it is somehow consistent with the CESP Plan.

In its mad rush to throw out numerous interlocking dockets and to not carefully analyze their interaction, the utility appears to be overly focused with guaranteeing itself a large profit at a time when the rest of the State is financially hurting.

Increased Use of Renewables

Smart Grids include both traditional renewable energy generation and traditional expansion of the transmission & distribution system to enable these facilities to interconnect to the grid. "Smart Grid technologies include ... renewable energy resources" (HECO Application page 35) "AMI implementation will help further FERC's stated objective of increasing transmission infrastructure for renewable energy." (HECO Application, page 39)

We had heard it all before. In 1981-83 HECO create its holding company ("Hawaiian Electric Industries") arguing that an unregulated child of its parent could better support expansion of renewables. In 1984 HEI suggested the utility could transform Hawaii with renewables by 2000. In the early years of the 2000s, HECO stated that the solution was an unregulated child ("Renewable Hawai`i Inc"). Now HECO is saying that it is a smart grid and the adoption of CESP principles designed to eliminate meaningful public review.

The bottom line is: will AMI reduce greenhouse gas emissions, reduce the importation of fossil fuel, increase the use of renewable energy, be cost-effective, be more reasonable than the other alternatives, lead to greater reliance on central station or distributed generation facilities, lead to greater control by the monopoly utility or a more diverse economy, increase or decrease rates? There is nothing in the Application that answers these questions.

Do people want a Smart Grid?

Because the definition of a smart grid is variable, along with its multiple manifestations and proposals, the answer to this question is it depends.

Opposition Elsewhere

By Stephen Simon (Wall Street Journal, February 9, 2009) "Beyond that, the very concept of the smart grid is controversial on many fronts. Some homeowners find it Orwellian, while consumer advocates tend to see it as a wasteful extravagance; they say utilities should focus on improving efficiency instead of spending billions on futuristic technology -- and passing the tab on to ratepayers. ... Not all consumers are likely to be so enthusiastic. Some early experiments with smart-grid ideas have seen considerable opposition. In

California last year, regulatory officials drew a storm of protest when they considered requiring all new homes to have thermostats that utilities could remotely adjust. They withdrew the proposal, which critics said smacked of Big Brother. ... Arshad Mansoor, a vice president of the Electric Power Research Institute, calls customer response a significant roadblock to smart grid. He's hopeful that the Boulder experiment will help utilities figure out how to smooth the way.
http://online.wsj.com/article/SB123378462447149239.html

Given the potential inconvenience and 'Big Brother' aspect of utilities controlling home appliances, it's time to convince energy users, By Josie Garthwaite Business Week (April 19, 2009)

Making the smart grid's most basic elements—two-way communication between utilities and energy users, advanced control systems, and smart devices—appealing to consumers could be key to its success. So how can smart grid backers make the investment look more like a boon and less like a boondoggle to those on the other side of the meter? ... For many utilities, adding information technology and two-way controls to electronic devices and appliances represents a potential gold mine of efficiency and a workaround for building expensive new power plants. ... For consumers, however, the benefits of the smart grid have proven to be less obvious, despite promises that it will offer more insight and control over their energy use (and spending). "It turns out customers don't actually want utilities to turn off their appliances," said Farber, referring to the two-way control technology that would allowing a utility to cut power use when demand strains supply.
http://www.businessweek.com/technology/content/apr2009/tc20090419_713545.htm

Concerns

US Energy System Poised To Make Digital Leap (June 6, 2009): "Energy Secretary Steven Chu, said the current grid stands in the way of increasing the use of renewable energy sources such as wind and solar that 'will need a system that can dispatch power here, there and everywhere on a very quick basis.' But Chu and others also worry about security. 'If you want to create mischief one very good way to create a great deal of mischief is to actually bring down a smart grid system. This system has to be incredibly secure. And there is the issue of intrusion. 'Is the average consumer willing to pay the upfront costs of a new system and then respond appropriately to price signals? Or will people view a utility's ability to reach inside a home to turn down a thermostat as Orwellian?' Sen. Lisa Murkowski, R-Alaska, said at a recent hearing on smart grid."

www.huffingtonpost.com/2009/06/09/smart-grid-us-energy-syst_n_212985.html

Testimony of Commissioner Suedeen G. Kelly, Federal Energy Regulatory Commission. Before the Committee on Energy and Natural Resources, United States Senate (March 3, 2009) "A critical issue as Smart Grid is deployed is the need to ensure grid reliability and cyber security. The significant benefits of Smart Grid technologies must be achieved without taking reliability and security risks that could be exploited to cause great harm to our Nation's citizens and economy. Finally, if the intent of Congress is for the Smart Grid standards to be mandatory beyond the scope of the Federal Power Act, additional legislation should be considered."

www.ferc.gov/EventCalendar/Files/20090303121917-09-03-03-testimony.pdf

Questions

How the installation of advanced meters and/or implementation of dynamic pricing, and remote functionality implicate existing privacy and consumer protection policies and programs.

Whether some customer groups benefit more than others, and whether some customer groups benefit while others are harmed.

Whether potential costs and benefits vary across customer group or geographically.

Whether perceived benefits can be achieved in another, more cost effective way.

Whether time based rates and other dynamic pricing programs should be mandatory or optional, and the customer impact of each.

Whether the metering technology is reliable, including the life expectancy in terms of both functional life and technical obsolescence.

Should the Commission consider a contingency plan for rendering and reconciling bills should the met.

Life of the Land's Position

1. Is the HECO Companies' proposal to implement the AMI project reasonable?

In general, AMI is a reasonable approach. The Devil is in the details. It appears that the utility is simultaneously developing and implement its AMI approach. This is similar to making an airplane while it is being flown on its maiden voyage. We defer stating a position on this issue at this time, pending HECO's release of additional documents including grid integration studies necessary to understand their proposal, and for the declassification of specified sections listed above.

Life of the Land believes that climate change is a very serious issue and must be dealt with immediately. It is unclear to us how this Application will directly or indirectly impact efforts to reduce greenhouse gas emissions, including issues dealing with the opportunity cost of money and the utility's desire to update an antiquated, aging, dumb, one-way grid instead of fully looking at alternatives.

2. Are the estimated project costs reasonable?

We defer at this time, pending HECO's release of documents necessary to understand their proposal.

3. Is the proposed accounting treatment of AMI project costs reasonable?

We defer at this time, pending HECO's release of documents necessary to understand their proposal.

4. Is the proposed cost recovery of AMI project costs for ratemaking purposes reasonable?

Life of the Land accepted the surcharge concept developed in previous dockets. Its application makes sense in this docket providing that the Application is reasonable. See answer number 1.

5. Are the terms and conditions of the Sensus Agreement between HECO and Sensus Metering Systems, Inc. reasonable, prudent and in the public interest?

The Agreement is confidential. The contract should be made public with phrase by phrase blacked-out sections instead of treating the entire document as confidential.

6. Are the proposed time of use rates reasonable?

We favor time of use rates but need more information before making a decision on this particular application. Life of the Land needs a better understanding of how Time Of Use Rates interact with a host of related issues including but not limited to: Feed In Tariffs, Net Metering, PV Host, and Vehicle To Grid (V2G).

Exhibit 1: Privacy Challenges Could Stall Smart Grid
By Susan L. Lyon (June 1, 2009)

President Barack Obama's plan to overhaul U.S. infrastructure includes constructing a nationwide "smart grid" that promises to help address many of our current energy challenges. The smart grid plan offers the hope that it "will save us money, protect our power sources from blackout or attack, and deliver clean, alternative forms of energy to every corner of our nation."

While these are noble societal goals, smart grid technologies and systems as envisioned also raise concerns about individual privacy rights.

Part of what makes the smart grid "smart" is its ability to know a lot about the energy-consuming devices in our homes and to monitor activity for those devices to help determine when power should be used or limited. Such knowledge is useful in regulating power consumption to use energy more efficiently.

In addition to reaching into homes to regulate devices, information about usage and activities could be extracted from homes. Home energy consumption patterns could be gathered and analyzed on a room-by-room and device-by-device basis to determine which devices are used and at what time of day. Although this sort of information may not be considered terribly invasive for some, for others anything that violates the sanctity of "home" may cause tremendous concern.

Those not concerned by the tracking of mere energy usage may become more concerned as devices in our home become increasingly "smarter." One can easily envision a not too distant state of technology convergence where such devices could be used to track more sensitive information. For example, security technology already exists to monitor presence in homes to detect break-ins. Could that same technology be applied in a smart-grid environment to monitor when residents are home?

What else will smart appliances "tell" others about households? Will a smart refrigerator be able to determine and disclose the types and quantities of RFID-chipped food products and pharmaceuticals stored on shelves? Who will get this information? Will retailers be able to access this information and use it for marketing and services? Will law enforcement? Concerns such as these are already top of mind for academics and consumer privacy rights advocates as these technologies develop.

These privacy concerns in relation to the smart grid were heightened recently with the introduction of a federal cybersecurity bill earlier this year. The Cybersecurity Act aims to protect our nation's infrastructure, including our energy grid, from threats by malicious hackers, terrorists and foreign intelligence. Privacy advocates and some industry associations have expressed concern about a provision in the bill that would allow access to "relevant data" of private sector information systems and preempt all other laws.

This provision has been viewed as an attempt at an end run around legal processes afforded by the Electronic Communications Privacy Act (ECPA) and the Privacy Act of 1974 to allow greater government surveillance. In considering legislation and policies designed to protect the smart grid, these concerns about preserving current privacy protections will need to be balanced against the importance of national security.

Private entities will also need to take privacy into account as they develop smart appliances and smart grid systems and processes. Existing privacy laws will place restrictions on many of the types of monitoring and data collection activities envisioned. Section 5 of the Federal Trade Commission (FTC) Act requires companies to adhere to their privacy policies and to engage in fair privacy practices. The Computer Fraud and Abuse Act places restrictions on information obtained from devices through its prohibitions against unauthorized access to private computers and systems.

In addition to taking into account existing laws, companies that develop smart grid technology would be wise to anticipate consumer reaction to privacy impacting systems and features and the policies and laws that continue to develop in this area. Fair information practice principles such as those recommended by the FTC provide a good roadmap for developing practices and process that address emerging privacy concerns and laws. The main principles to consider will be in the areas of notice and choice.

Companies developing smart grid processes and devices should consider how to provide consumers notice about what information is collected from and about their homes and households, who is getting the information, and for what purposes the information will be used. Companies should also develop means to allow consumers to have choice and control over the information that gets collected and disclosed.

The nature of the smart grid requires ubiquitous deployment of monitoring technology in every home it touches. The impact of this is significant considering that privacy of the home is such an important value in our society that its protection is guaranteed in the U.S. Bill of Rights, "The right of the people to be secure in their ... houses ... shall not be violated." So while the benefits of a unified national smart grid system are very clear to most, as with any technology, the systems that provide these societal benefits and the policies that shape them should be designed to account for the privacy concerns of the individuals they serve.

About the Author: Susan L. Lyon, of counsel in law firm Perkins Coie's Privacy & Security practice, has extensive experience representing multinational companies on privacy, data security, online safety and Internet laws

Exhibit 2: Security Alert: Risks Change with AMI (April 2008)

By Betsy Loeff, Utilimetrics News Writer

The process of meter reading has always had a laundry list of liabilities. Fender benders, dog bites, slips, trips and falls: They're common meter-reader mishaps.

Many utilities add the loss of these hazards to the benefits listed in an AMR business case. But while automation slashes the workday woes human meter readers face, it doesn't free utilities from liability completely. It changes the risks from the physical to more extensive information protection. Implementation of AMI and demand response technologies prompts cyber-security and customer-information privacy issues to arise.

Even in today's world of manual meter reads, the reads are put onto a handheld device, set in a cradle and sent back into the utility's information system, so the loss of a hand-held is an issue, even if it is encrypted. Such a device may contain more customer specific information than an AMI meter even would. It is this always-on connection that elevates the issue of security.

Wired Open World

When, with the plant owner's permission, IBM researcher Scott Lunsford hacked into a nuclear power plant last year, he wasn't trying to make mischief. He was trying to make a point: Utility systems can be breached.

Forbes covered the event in a story titled, "America's Hackable Backbone." In it, writer Andy Greenberg pointed out that the vulnerable underbelly of utilities tends to rest in their supervisory control and data acquisition (SCADA) systems.

That was certainly the case when Vitek Boden, a disgruntled former employee of the Maroochy Water System in Queensland, Australia, hacked into utility systems using a laptop and proprietary SCADA equipment he carried around in his car. Boden managed to disrupt pumping operations, thereby spilling sewage throughout that little corner of Australia's Sunshine Coast. All he had to do was send the right commands to critical valves.

A similar attack could unleash mayhem for electric utilities with remote disconnection switches built into AMI meters. "We need to make sure the 13-year-old hacker next door can't go and turn all those disconnects off in a wide area," says Erich Gunther, chairman, chief technology officer and co-founder of EnerNex Corporation, an energy-industry research firm and consultancy based in Knoxville, Tenn.

Gunther is a member of the U.S. Department of Energy's GridWise Architecture Council, lead consultant with the Electric Power Research Institutes IntelliGrid project and founder of several utility working groups and task forces examining AMI. One is AMI-SEC, a subgroup of UtilityAMI that focuses specifically on security issues.

According to him, there are few standards and "a total absence of best practices in the security area." But, he's out to change that.

Picture The Worst

"The issue is that the utility industry hasn't taken security seriously in field devices," Gunther maintains. Last year, the North American Electric Reliability

Corporation issued a list of critical-infrastructure protection standards to safeguard the transmission system, "but it doesn't address the new vulnerabilities for devices that have integrated service disconnects and pathways into the home."

Gunther isn't concerned that AMI creates a pathway into utility systems. While communications networks used in metering allow utilities to send signals to customers and retrieve data from those end-user sites, he maintains, "there's no easy way someone could use the meter to go back and make a request on the utility system." Today's architectures hinder such malfeasance.

"The greatest vulnerabilities are the potential impact on the end users," Gunther continues. He cites unauthorized control of remote disconnection capabilities as the biggest danger, and it's one that now exists for water utilities, too, as several vendors offer disconnection valves. "It's huge. If someone found a way to operate those disconnects in a wide area, he could cause widespread outages."

Another peril for electricity providers lies in what Gunther calls "spoofing a load control signal."

Suppose a hacker found a way to make in-home load-shedding devices think some sort of grid-instability event was afoot. By sending a false curtailment signal, that hacker could prompt in-home equipment to shut down the pool pump, cycle off the air conditioner or cut the heating element on a clothes dryer, for starters. Such action might simply cause consumers inconvenience. But, what if the hacker sent the same sort of false signal telling all the equipment to come back on during a critical peak? Blackouts could follow, Gunther says.

The same is true if a hacker interfered with the load-curtailment signals sent by a utility. "If the utility is activating all of its demand-response capabilities so that they don't have to go into rolling blackouts and someone interferes, boom, you're back in the blackout scenario," he continues.

Ganging Up On The Problem

AMI-SEC, the group Gunther co-chairs, is taking a comprehensive look at threats like these and strategizing ways to meet them.

According to Gunther, there are cryptographic means to mitigate risks, as well as simple business rules that could safeguard utilities and their customers. With respect to exposure to external attack over communication channels, he offers this example: "Have a business rule that says no external command can result in an increase of electricity usage."

Although the AMI-SEC is not a standards group per se, participants hope to have the same kind of "successful" sway as the parent organization, UtilityAMI, had in influencing vendors' product development, Gunther says.

Such utility collaboration could offer important leverage because, as Deidre Mulligan notes, "privacy and security don't tend to be competitive features in the marketplace as standalone features," so vendors have less incentive to focus on these issues.

As IT organizations take a larger role in AMI, the issue of security has become more prominent. It is in all RFI/RFP solicitations, and is the focus of technical evaluations. Many AMI vendors have performed internal and external threat analysis and security reviews. From an evaluation standpoint, there is no standard basis on which to judge and compare different systems in this area.

Mulligan is a clinical professor of law at University of California's Berkeley School of Law, and she was a key researcher contributing to the 2005 report on "Network Security Architecture for Demand Response/Sensor Networks" that was produced for the California Energy Commission (CEC).

According to her, it's difficult for vendors to earn payback for security features because it's tough to prove things didn't happen as a result of the preventative action you took. That is, vendors would be hard pressed to say, "Because we have a really secure meter, we didn't have any exposure, so trouble didn't crop up." That, she says, makes it challenging to decide how much to invest in security protections.

Mulligan thinks that once utilities, regulators and technology vendors identify risks and solutions, "the market will sort it out. If it turns out that utilities are not going to buy meters unless the data are encrypted at the source, then that will happen. If it turns out the utilities can encrypt the data in transit or create some kind of encrypted channel, then that will happen."

Encryption is one of the key security recommendations Mulligan and her team came up with for the CEC. At the time the report was created, "a lot of information flows were in a proprietary format, not encrypted," she explains. "That introduces opportunities for mischief at the ground level in ways that utilities should be concerned about."

The lengthy report offers much insight into how AMI networks operate, where weak links exist and what might be good ways to shore them up. Among the areas to fortify against intrusion, it lists:

Communications links: Information should flow only between authorized users and endpoints.

Data integrity: Make sure the data are accurate, and protect them against unauthorized changes or deletion.

Access control: Limit access to data, network resources and applications to authorized users only.

Authentication: Confirm identities of communicating entities — people, devices and applications — and validate the integrity of messages.

Non-repudiation: Tracking methods could prevent hackers from denying that they performed a particular action on the network by creating a cyber breadcrumb trail.

Data confidentiality: Don't just keep the data under lock and key. Make certain unauthorized users can't understand it. "Encryption, access control lists and file permissions" are three tools to use, according to the report.

Customer privacy is another area covered by the CEC document, and it is likely to be something utilities will need to guard closely.

For one thing, privacy of a customer's usage information can be a security risk to customers themselves. "Many utilities will be streaming real-time usage data into customers' homes," Gunther notes. "A thief could be trolling around the neighborhood, looking for usage that's really low," or discerning when people go to work based on the trends that show up in their consumption patterns. "There are real issues from a crime aspect when someone can understand another person's schedule just by looking at energy usage."

www.utilimetrics.org/source/newsletter/index.cfm?fuseaction=Newsletter.showThisIssue&Issue_ID=69

CERTIFICATE OF SERVICE

The original and 8 copies of the foregoing LIFE OF THE LAND's TESTIMONY & MOTION FOR DISCOSURE in Docket 2008-0303 was filed with the Public Utilities Commission and served on the date of filing by e-mail to the following parties:

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Henry Q Curtis

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